Section A.

Technical Notes

SCOPE OF SURVEY

Data presented in this report are collected annually through the National Science Foundation's (NSF) Survey of Federal Science and Engineering (S&E) Support to Universities, Colleges, and Nonprofit Institutions (Federal S&E support survey). The survey originated in 1965, when the Committee on Academic Science and Engineering (CASE) within the Federal Council for Science and Technology established the CASE data collection system to report annually on Federal S&E obligations to academic institutions and associated federally funded research and development centers (FFRDCs). Since 1968, CASE data, as well as data on nonprofit institutions, also have served as the basis for an annual report to the President and Congress.

This survey is designed to collect information from Federal agencies on (1) total S&E program support in thousands of dollars to academic institutions, (2) total S&E support to FFRDCs administered by academic institutions, and (3) research and development (R&D) and R&D plant support to nonprofit institutions and associated FFRDCs.

Data are shown for Federal S&E obligations to institutions classified as historically Black universities and colleges by type of activity, agency, and R&D obligations.

The FY 1996 data in this report were submitted by 18 Federal agencies, covering the period October 1, 1995, through September 30, 1996. Data reported by the Agency for International Development, the Departments of Housing and Urban Development, Labor, and Transportation, the General Services Administration, the Nuclear Regulatory Commission, the Office of Justice Programs, and the Social Security Administration were combined, because of space constraints, to constitute the "other" category in tables that show funding by agency. In 1996, these eight agencies accounted for less than 2 percent of all Federal S&E academic support. In most tables that list data by agency and individual institution, the "other" column includes data from the Department of the Interior in addition to those eight agencies. In 1996, the 18 agencies reported obligations to 1,082 universities and colleges, 40 academic system offices, and 1,133 independent nonprofit institutions.

In FY 1996, the Johns Hopkins University Applied Physics Lab (APL) accounted for more than 95 percent of Johns Hopkins' $353 million in total S&E funding from the Department of Defense (DoD). During the FY 1987 survey cycle, DoD determined that some funds reported in prior years as R&D obligations to APL were more appropriately classified as "other sciences and engineering." Data for FYs 1984–86 were revised, but DoD was unable to revise data prior to FY 1984.

To better differentiate between that part of the Federal R&D budget that supports "science and key enabling technologies" (including for military and non-defense applications) and that part that primarily concerns "testing and evaluation of large technical systems prior to production" (of mostly defense-related systems), NSF now collects data on DoD development dollars in two categories: advanced technology development and major systems development.

As a result of trend editing of the Department of Education's (ED's) data each year, a small number of academic institutions' dollar totals are distributed by type of activity (R&D, R&D plant, etc.) on a prorated basis through FY 1992 by NSF because ED could evaluate the data only on a "total obligations" basis. During the FY 1987 survey cycle, ED determined that institution coding problems in earlier years caused its database to produce several large funding trend shifts at specific universities.

ED has made major software modifications to the automated system from which the Federal S&E data were produced. Therefore, due to a revamped coding structure, there are trend differences among institutions' data from ED beginning in FY 1993. Those trend differences were a major factor in NSF's decision not to publish "non-S&E" totals beginning for the FY 1993 report. ED accounted for 91 percent ($5.9 billion) of the total Federal support for "non-S&E" ($6.5 billion) for FY 1993. To explain ED's downward academic R&D trend between FY 1993 and FY 1994 (from $95 million to $49 million), the agency stated that academic R&D programs in FY 1994 either were not funded, did not have an S&E component, or received reductions in funding.

"R&D plant" in this report refers to large facilities and fixed equipment. Data on "research instrumentation" are not separately identifiable in this report. Research instrumentation funds are for equipment purchased under research project awards from current-fund accounts and are included under totals for R&D.

Some agencies not surveyed may account for a significant proportion of the total receipts at some institutions, even though those receipts may constitute a small proportion of total academic R&D.

Obligations listed for individual institutions reflect direct Federal S&E support so that amounts subcontracted to other institutions are included. Those funds received through subcontract arrangements from prime contractors are excluded.

Federal obligations to institutions are presented on the basis of the individual institutions that are components of the system, but obligations awarded directly to the central administration of a system are listed separately. If the final destination of the funds is not known, however, the agencies report them as obligations to a system's administrative office, or "central system," from which the funds are distributed to the system's individual institutions.

Other Science Resources Studies Reports on Federal R&D Funding

In addition to the Survey of Federal Funds for Research and Development report, the NSF Division of Science Resources Studies publishes one other report related to Federal R&D funding. *National Patterns of R&D Resources* includes information on R&D expenditures by different performers including industry, academia, and the Federal Government. The expenditures data in *National Patterns*, with the exception of Federal intramural R&D, are based on sample surveys of the performers of R&D. Respondents are asked to report how much they actually spent on R&D during the year and the source of those funds. Data in *National Patterns* are based on expenditures reported by performers; performers of R&D often expend Federal funds in a different year from the one in which the Federal Government provided authorization, obligations, or outlays.

Definitions

Obligations are the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payment of money is required. Obligations differ from expenditures in that funds allocated by Federal agencies during one fiscal year may be spent by the recipient institution either partially or entirely during one or more subsequent years.

Type of Institution

Universities and colleges are those institutions of higher education in the United States that offer at least 1 year of college-level study leading toward a degree. A university or college comprises all parts of an academic institution, such as colleges of liberal arts, professional schools, hospitals, schools of agriculture, and agricultural experiment stations, including bureaus, offices, and research centers (excluding FFRDCs), whether located on or off the main campus, and branch campuses controlled directly by the parent institution. The universe of academic institutions that is the foundation of this survey is derived from the higher education institutions' portion of ED's Integrated Postsecondary Education Data System (IPEDS), sponsored by the National Center for Education Statistics, and the *1997 Higher Education Directory*, published by Higher Education Publications, Inc.

Institutions included are those that received Federal S&E support during FY 1996 and possessed a significant degree of academic and administrative autonomy. Institutions within a system (a group of institutions having a collective legal status and generally recognized by a state government, a board of education, or other relevant organization) in which a significant degree of autonomy remains at the individual institution level are presented separately; obligations to branch campuses are included in the totals for their parent institutions. The study excludes all obligations to the service academies and to the U.S. Department of Agriculture Graduate School.

Independent nonprofit institutions are legal entities other than universities and colleges, privately organized or chartered to serve the public interest, and exempt from most forms of Federal taxation. Data presented for nonprofit institutions and for nonprofit-administered FFRDCs are obligations for R&D and R&D plant reported by the 18 participating agencies.

Coverage of the nonprofit section in the Federal support survey was expanded beginning in the late 1970s to include all types of nonprofit institutions that receive

Federal R&D funds. For NSF purposes the types of institutions are defined as follows:[1]

1. **Research institute.** A separately incorporated, independent nonprofit organization operating under the direction of its own controlling body, the primary function of which is the performance of R&D in S&E.

2. **Voluntary hospital.** A member of the American Hospital Association not subject to the control of either Federal, State, or local governments, nor an integral part of any institution of higher education. Hospitals that have been set up by research institutes and that, although providing patient care, function primarily as laboratories for the research institutes are included in the "Research institute" category.

3. **All other independent nonprofit institutions.**

   (a) **Professional or technical society, or academy of science and engineering.** A voluntary association of individuals sharing a common interest in the advancement of knowledge, either within a single field or across a broad spectrum of disciplines. The major function of these organizations is to aid and encourage the collection, collation, and dissemination of S&E knowledge for the benefit of their members and the community as a whole.

   (b) **Private foundation.** A non-governmental, nonprofit organization having a principal fund of its own, managed by its own trustees or directors, and established to maintain or to aid social, educational, charitable, religious, or other activities serving the common welfare. Private foundations include operating foundations that allocate the greater proportion of their R&D budgets to intramural performance and philanthropic foundations that allocate most of their funds to grants and contracts for research to be performed extramurally.

   (c) **Science exhibitor.** A nonprofit organization with the primary goal of expanding scientific literacy within the community by providing exhibits that display and interpret the latest scientific findings within its field or fields. Included in this category are museums, zoological parks, botanical gardens, and arboretums.

   (d) **Trade association.** An organization of business competitors, in a specific industry or business, that is interested primarily in the commercial promotion of products or services. Membership is usually held in the name of a business entity. Activities may fall into one or more of the following areas: business ethics, management practices, standardization, commercial (i.e., statistical) research, publication, promotion, and public relations.

   (e) **Agricultural cooperative.** An organization of individuals or business entities that are normally competitors in the production and sale of agricultural products. Activities may fall into one or more of the following areas: collective marketing or purchasing, research, public relations, and the improvement of the economic condition of the farm population of the United States.

Category of Support

Academic science and engineering includes all obligations for R&D; R&D plant; facilities and equipment for S&E instruction; fellowships, traineeships, and training grants (FTTGs); general support for S&E; and other S&E activities. These activities are defined as follows:

1. **R&D** includes all research activities, both basic and applied, and all development activities that are supported at universities and colleges. Demonstration projects conducted to discover whether a technology or method is workable are considered to be within the scope of R&D if their objective is to produce new information within a specific time period.

   "Research" is defined as systematic study directed toward fuller scientific knowledge or understanding of the subject studied. Research can be classified as basic or applied, although

[1] National Science Foundation, *R&D Activities of Independent Nonprofit Institutions, 1973* (NSF 75-308) (Washington, DC: GPO, 1975)

data reported here are not separated into these categories. In basic research the investigation is oriented toward gaining a better knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind. In applied research the investigation is aimed at gaining the knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.

"Development" is the systematic use of knowledge and understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including design and development of prototypes and processes.

R&D excludes topographic mapping and surveys, collection of general-purpose statistics, and activities concerned primarily with the dissemination of scientific information. Also excluded are routine product testing, quality control, and R&D facilities and fixed equipment.

"Research equipment" is included as part of R&D. It includes any item (or interrelated collection of items constituting a system) of nonexpendable tangible property or software having a useful life of more than 2 years and an acquisition cost of $500 or more that is used wholly or in part for research.

2. **R&D plant** includes all costs—direct, indirect, and related—of all projects with the main objective of providing support for the construction, acquisition, renovation, modification, repair, or rental of facilities, land, works, or equipment for use in S&E R&D. A facility is interpreted broadly to be any physical resource important to the conduct of R&D. Excluded are expendable research equipment and office furniture and equipment.

3. **Facilities and equipment** for S&E instruction include all programs with the main purpose of providing support for the construction, acquisition, renovation, modification, repair, or rental of facilities, land, works, or equipment for use in instruction in S&E.

4. **Fellowships, traineeships, and training grants** include graduate programs in support of the development and maintenance of S&E personnel resources. The total amounts pertaining to such awards (stipends and cost-of-education allowances) are reported on the basis of the institution chosen by the recipient. Excluded are programs that support research and education institutes, seminars, and conferences such as teacher-training activities provided through teacher institutes, short courses, research participation, and in-service seminars; activities aimed at the development of education techniques and materials for use in S&E training; and programs that provide special opportunities for increasing the scientific knowledge and experience of pre-college and undergraduate students. These activities are included in "other science and engineering activities" (see category 6) if they are S&E-oriented.

5. **General support for S&E** includes programs that support nonspecific or generalized purposes related to scientific research and education. Such projects are generally oriented toward academic departments, institutes, or institutions as a whole and embody varying types of support, ranging from support provided without any specification of purpose other than that the funds be used for scientific projects to projects in which funds are provided for activities within a specified field of S&E without a specific purpose. The National Institutes of Health's (NIH's) Biomedical Research Support Grants and Minority Biomedical Support Grants are examples of these types of programs.

6. **Other S&E activities** include all academic S&E activities that cannot be assigned to one of the preceding five categories, including obligations in support of technical conferences, teacher institutes, and activities aimed at increasing the scientific knowledge of precollege and undergraduate students.

Federally Funded Research and Development Centers

The following is a list of federally funded research and development centers (FFRDCs) included in the Federal S&E support survey. The list is arranged by sponsoring agency and administering organization (in parentheses). Respondents reported under the FFRDC category funds that were obligated to the centers identified on this list.

Department of Defense

Office of the Secretary of Defense

Administered by other nonprofit institutions[1]

Institute for Defense Analyses Studies and Analyses FFRDC (Institute for Defense Analyses), Alexandria, VA

Logistics Management Institute (Logistics Management Institute), McLean, VA[2]

National Defense Research Institute (RAND Corp.[3]), Santa Monica, CA

C3I Federally Funded Research and Development Center (MITRE Corp.[4]), Bedford, MA, and McLean, VA

Defense Advanced Research Projects Agency

Administered by universities and colleges[5]

Software Engineering Institute (Carnegie Mellon University), Pittsburgh, PA

National Security Agency

Administered by other nonprofit institutions[1]

Institute for Defense Analyses Communications and Computing Federally Funded Research and Development Center[6] (Institute for Defense Analyses), Alexandria, VA

Department of the Navy

Administered by other nonprofit institutions[1]

Center for Naval Analyses (The CNA Corp.), Alexandria, VA

Department of the Air Force

Administered by universities and colleges[5]

Lincoln Laboratory (Massachusetts Institute of Technology), Lexington, MA

Administered by other nonprofit institutions[1]

Aerospace Federally Funded Research and Development Center (The Aerospace Corp.), El Segundo, CA

Project Air Force (RAND Corp.[3]), Santa Monica, CA

Department of the Army

Administered by other nonprofit institutions[1]

Arroyo Center (RAND Corp.[3]), Santa Monica, CA

Department of Energy

Administered by universities and colleges[5]

Ames Laboratory (Iowa State University of Science and Technology), Ames, IA

Argonne National Laboratory (University of Chicago), Argonne, IL

Brookhaven National Laboratory (Associated Universities, Inc.), Upton, Long Island, NY

Ernest Orlando Lawrence Berkeley National Laboratory (University of California), Berkeley, CA

Fermi National Accelerator Laboratory (Universities Research Association, Inc.), Batavia, IL

Lawrence Livermore National Laboratory (University of California), Livermore, CA

Los Alamos National Laboratory (University of California), Los Alamos, NM

Oak Ridge Institute for Science and Education (Oak Ridge Associated Universities, Inc.), Oak Ridge, TN

Princeton Plasma Physics Laboratory (Princeton University), Princeton, NJ

Stanford Linear Accelerator Center (Leland Stanford Junior University), Stanford, CA

Thomas Jefferson National Accelerator Facility[7] (Southeastern Universities Research Association, Inc.), Newport News, VA

Administered by other nonprofit institutions[1]
National Renewable Energy Laboratory[8] (Midwest Research Institute), Golden, CO

Pacific Northwest National Laboratory (Battelle Memorial Institute), Richland, WA

National Aeronautics and Space Administration

Administered by universities and colleges[5]
Jet Propulsion Laboratory (California Institute of Technology), Pasadena, CA

National Science Foundation

Administered by universities and colleges[5]
National Astronomy and Ionosphere Center (Cornell University), Arecibo, PR

National Center for Atmospheric Research (University Corp. for Atmospheric Research), Boulder, CO

National Optical Astronomy Observatories[9] (Association of Universities for Research in Astronomy, Inc.), Tucson, AZ

National Radio Astronomy Observatory (Associated Universities, Inc.), Green Bank, WV

Administered by other nonprofit institutions[1]
Critical Technologies Institute (RAND Corp.[3]), Washington, DC

Nuclear Regulatory Commission

Administered by other nonprofit institutions[1]
Center for Nuclear Waste Regulatory Analyses (Southwest Research Institute), San Antonio, TX

Department of Transportation

Federal Aviation Administration

Administered by other nonprofit institutions[1]
Center for Advanced Aviation System Development (MITRE Corp.[4]), McLean, VA

Department of the Treasury

Internal Revenue Service

Administered by other nonprofit institutions[1]
Tax Systems Modernization Institute (IIT Research Institute), Lanham, MD

Endnotes

[1] That is, other than universities and colleges.
[2] Logistics Management Institute (LMI) moved from Bethesda, MD, to McLean, VA, in May 1994.
[3] The following portions of the RAND Corp. are FFRDCs: Project Air Force, National Defense Research Institute (formerly Defense/Office of the Joint Chiefs of Staff), the Arroyo Center, and the Critical Technologies Institute. All other agency support to RAND is reported under nonprofit institutions.
[4] Only the C3I Federally Funded Research and Development Center and the Center for Advanced Aviation System Development parts of the MITRE Corp. are FFRDCs. All other agency support to MITRE is reported under nonprofit institutions.
[5] Includes university consortia.
[6] Although the Institute for Defense Analyses Communications and Computing FFRDC has been in existence since 1956, the Department of Defense added it to the Master Government List of FFRDCs for the first time in October 1995.
[7] In May 1996 the name was changed from Continuous Electron Beam Accelerator Facility.
[8] In September 1991 the name was changed from Solar Energy Research Institute.
[9] Since February 1984 this center has included three former FFRDCs: Cerro Tololo Inter-American Observatory, Kitt Peak National Observatory, and the National Solar Observatory (formerly Sacramento Peak Observatory).

NOTES: The Department of the Army decertified the Institute for Advanced Technology (University of Texas), Austin, TX, as an FFRDC in November 1993. All obligations previously reported to this institution should be reported under universities and colleges.

The Department of Energy removed the Inhalation Toxicology Research Institute from the Master Government List of FFRDCs in May 1996.